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Montana State Highway Department

Fred Quinnell, Jr. State Highway Engineer

SAFETY MANUAL

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Montana State Highway Commission

HARRY L. BURNS, Chairman
L. V. SWANSON, Vice Chairman
ROY L. SORRELLS, Commissioner
OTIS S. WATERS, Commissioner
S. N. HALVORSON, Commissioner

Compiled by
Cato K. Butler
Safety Coordinotor

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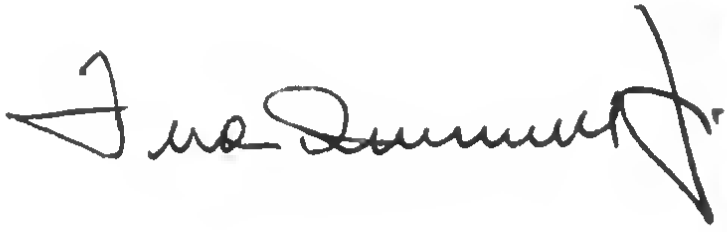
INTRODUCTION

The nation, as a whole, is taking a closer look into safety and the ways one may protect himself and his fellow man.

The Montana State Highway Department would appreciate your cooperation in using this Safety Manual. You will thus accomplish in the saving of lives and injuries for which no monetary value can be set.

Also, a great savings in the Department in lost time and damaged equipment.

This Manual is for you and your safety—use it.



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Section 1

COOPERATION FOR SAFETY

(A) **Duties of Supervision—**

Safety, primarily, is the joint responsibility of both the employer and the employee.

The employer should provide for:

1. The initiation of a sound safety program, with the policies, procedures, and staff necessary to make it effective.
2. The provision of safe working conditions, machinery, and equipment and personal safety protective devices and apparel, where necessary.
3. The development of effective training programs for supervisors and employees.
4. The encouragement of employee interest, and participation by making available channels through which employees may offer suggestions, advice, and recommendations for the improvement of safety.

(B) **Duties of Employees—**

Cooperation in the safety program is the moral obligation of each individual employee, such as:

1. Working safely on his job.
2. Having regard at all times for the safety of fellow employees.

3. Using his knowledge and influence to prevent accidents.
4. Calling attention to unsafe conditions.
5. Contributing his ideas and suggestions for the improvement of safety.

(C) Public Relations—

Public relations are a very important part of our work, and general highway courtesy will do a great deal toward improving these relations. The day by day actions of state employees create favorable or unfavorable comment by the traveling public. They are subject to more unfavorable comment perhaps than other workers.

Driving at an excessive speed or at a very slow speed, passing long lines of traffic, pulling around traffic that is slowing down for warning signs, improper use of warning signs —all do a great deal toward destroying good public relations.

State vehicle accidents where someone is injured, especially children, hurt our public relations.

A neat flagman who can tell the traveling public, in a few pleasant words, why and for how long they are being stopped, will do a great deal toward improving our relations, supervisors, foremen, R/W Personal, and flagmen make the majority of the contacts with the public, and the impression they leave is the impression the public has of the Department.

Treat the public as you would want to be treated. Courtesy and pleasant, cheerful manner will pay off in friends for the department.

To have good public relations, we must first have good employee relations one with another.

Section 2
GENERAL SAFETY RULES

(A) Safe Practices—

Housekeeping—

Housekeeping is one of the most important factors in accident prevention. Housekeeping is not only cleanliness, but it is also keeping things in order, and in the proper place in buildings, yards, stockpile areas, on the work and in the equipment.

Men trip over loose objects on floors, stairs and platforms; they are hit by articles falling from overhead scaffolds; they slip on greasy, wet or dirty floors; they run against projecting, poorly piled, or poorly placed materials; improperly piled, or improperly supported materials fall on them; they step on, or tear their hands on projecting nails.

Lifting—

Lift with your leg muscles, and not with your back.

Keep well balanced, and don't twist your body while lifting.

Lift carefully, don't jerk. For heavy lifts, get help.

Grinding—

Make sure that guards are properly in place, and that the tool rest is correctly adjusted.

Stand to one side of grinding wheel when first starting machine, as a defective wheel might break when starting up.

Wear safety goggles at all times when using a grinding wheel.

Keep tool rest as close as possible to the wheel—not over ⅛ inch. Apply moderate grinding pressure, and take light cuts.

Keep grinding wheel properly dressed so abrasive grains are always exposed, and wheel is in balance.

When mounting a grinding wheel remove paper from the sides of the wheel so the safety washer can grip the stone.

The collar should be two-thirds the size of the wheel and the same size collar should be used on both sides of the wheel.

Wheel failures are caused by, incorrect mounting, excessive speeds, cracks or flaws in wheel and improper use of wheel such as striking wheel with tool.

Chain Saws—

Stop the engine when you complete the felling cut, and are retreating to safe ground.

Stop the engine when carrying the saw through the woods.

Stop the cutting chain when you have completed the cut. Never lift the saw out of the cut with the chain running.

Think before you start the engine.

Think while the engine is running.
Think while the cutting chain is in motion.
Think about where the tree will fall.
Think about others within reach of the tree.

The chain saw is a wonderful labor saving tool but if the proper precautions are not taken it can also be very hazardous.

General—

When scaling a cliff, wear a hard hat and a safety belt. Examine the face for loose rocks; avoid working under other men; always pry from above or from the side of the rock.

Trenches with vertical sides shall be held with timber bracing if they are six feet or more in depth.

When carrying long materials on shoulders, both men should carry on the same shoulder, and be in step.

Keep a safe distance from other employees when cutting brush.

Keep tools sharp. More injuries occur with dull tools than with sharp ones.

Look both ways before crossing the highway.

Haste is the cause of a great many personal injuries; take a little more time and do the job safely.

Keep your mind on your work, both working and driving. Watch where you are going.

Worry can be a menace to your work and your safety. If troubled about something con-

centrate on your work; attack is the best defense.

(B) **Prohibited Practices—**

Men shall not ride on the fenders, hood or running board of any vehicle.

No one shall jump on or off of vehicles when they are in motion.

Do not ride loads being lifted by cranes.

Do not hurry up, or down, stairs, and avoid running and jumping.

Do not get under loads which are being carried by cranes.

Never remove trash from a mower sickle while the sickle is in motion; throw it out of gear before touching it.

Do not use improper, b r o k e n, or mushroomed tools, or tools with split or broken handles.

(C) **Intoxicants—**

No intoxicating liquor or beverage shall be brought upon the grounds owned or operated by the Highway Dept., nor will any intoxicants be transported in any vehicle owned by same. Under no circumstances shall an employee under the influence of intoxicants attempt to operate any vehicle or piece of equipment owned or leased by the State. The foreman will not allow an employee to go on the job if it is deemed that his condition will in any way jeopardize the safety of other employees, property, or equipment.

Section 3

ACCIDENTS—WHAT TO DO

(A) FIRST AID

Severe Injury—

Haste in moving, no benefit to victim.

Unskilled handling of accident victims has probably resulted in hundreds of cases of paralysis or permanent injury.

Don't move the victim until you know the extent of his injuries, as hasty handling of an injured person before the arrival of medical aid may kill or cripple.

Those first on the scene should immediately summon a physician or ambulance.

If there are no trained first-aiders present, it is imperative that over-anxious by-standers be kept from moving the victim unless he is threatened by fire or some other immediate danger.

The head of an injured person unable to move his legs or hands should not be lifted as this condition may denote a broken back or neck.

Even when the injured person is able to move hands and feet, there may be injury to the spine, making it advisable to wait for trained assistance before moving him.

If the neck or back is broken, the task of easing the victim on stretcher or plank is a job for an expert.

Keep the victim as warm and comfortable as possible without moving him, while waiting for qualified help.

Bleeding—

Severe bleeding is one of the few conditions demanding fast work as the loss of more than two pints of blood at one time can be serious.

In all serious bleeding, first apply pressure at the proper point to stop the bleeding.

Then as soon as possible apply a compress at the site of the bleeding, press firmly, and release the pressure at the pressure point for a trial period.

Direct pressure can be made by placing a thick layer of sterile gauze, or a freshly laundered handkerchief, against the bleeding point and applying firm pressure with your hand until a bandage can be applied firmly over the pad of gauze while the pressure is maintained.

If bleeding is not controlled by the firmly pressed gauze compress, then a tourniquet will be necessary. A tourniquet is always dangerous and should not be used unless all other means of stopping the bleeding fail.

If the circulation is cut off for too long a time, the part dies and gangrene sets in.

Loosen the tourniquet every fifteen to twenty minutes, but do not remove it. If bleed-

ing does not start again, let the tourniquet remain loose. If bleeding starts, tighten the tourniquet again.

There are two convenient places for applying a tourniquet correctly to control bleeding: 1. around the upper arm, about a hand's breadth below the armpit, and 2. around the thigh, about the same distance below the groin.

Shock—

Shock occurs when there is a severe injury to any part of the body from any cause, such as severe bleeding, burns, crushing injuries, fractures of bones and injuries to the head and chest.

Any person severly injured in any of these ways will develop shock, and treatment must be started immediately without waiting for symptoms of shock to develop.

Look for these symptoms of shock: Eyes vacant and lack luster, pupils dilated, breathing shallow and irregular, skin on face and hands pale, cold and moist, pulse weak or absent.

Treatment of Shock—

Patients in shock are generally cold and exposure to cold increases the severity of shock. It is important to conserve body heat and keep the patient warm.

In many cases, the only first aid necessary is to wrap the patient underneath, as well as on

top to prevent loss of body heat, using blankets, robes, coats, newspapers, etc.

If the patient complains of being cold after covering him, apply external heat by using hot water bottles or bags, glass jars and bottles. On the highway, hot water can be taken from the car radiator to fill the bottle. These objects should be tested for heat by holding them against your own face and do not overheat the patient. Rubbing the patient is of doubtful value, it is better to keep him quiet.

Keep the patient's body horizontal, or tilt his body by raising the feet twelve inches above horizontal so that the blood flows to the upper portions. The one exception is a chest injury, when the patient should be kept horizontal with head slightly raised.

First Aid Kits—

Every shop and piece of motorized equipment shall be provided with a standard first aid kit.

Foremen responsible for the equipment shall check the kits regularly, and requisition the necessary supplies and replacements to keep the kit in first class condition.

In shops, the first aid kits shall be placed where they can be readily seen by the employees.

(B) REPORTS

All personal injuries and vehicle accidents shall be reported even though they may seem

minor at the time, they may develop into something serious later.

Get as complete a record as possible of the circumstances at the scene of the accident.

Make no statement to anyone except to an officer of the law, a department representative, or to a representative of our insurance carrier.

Accident reports should be complete, truthful and promptly sent in.

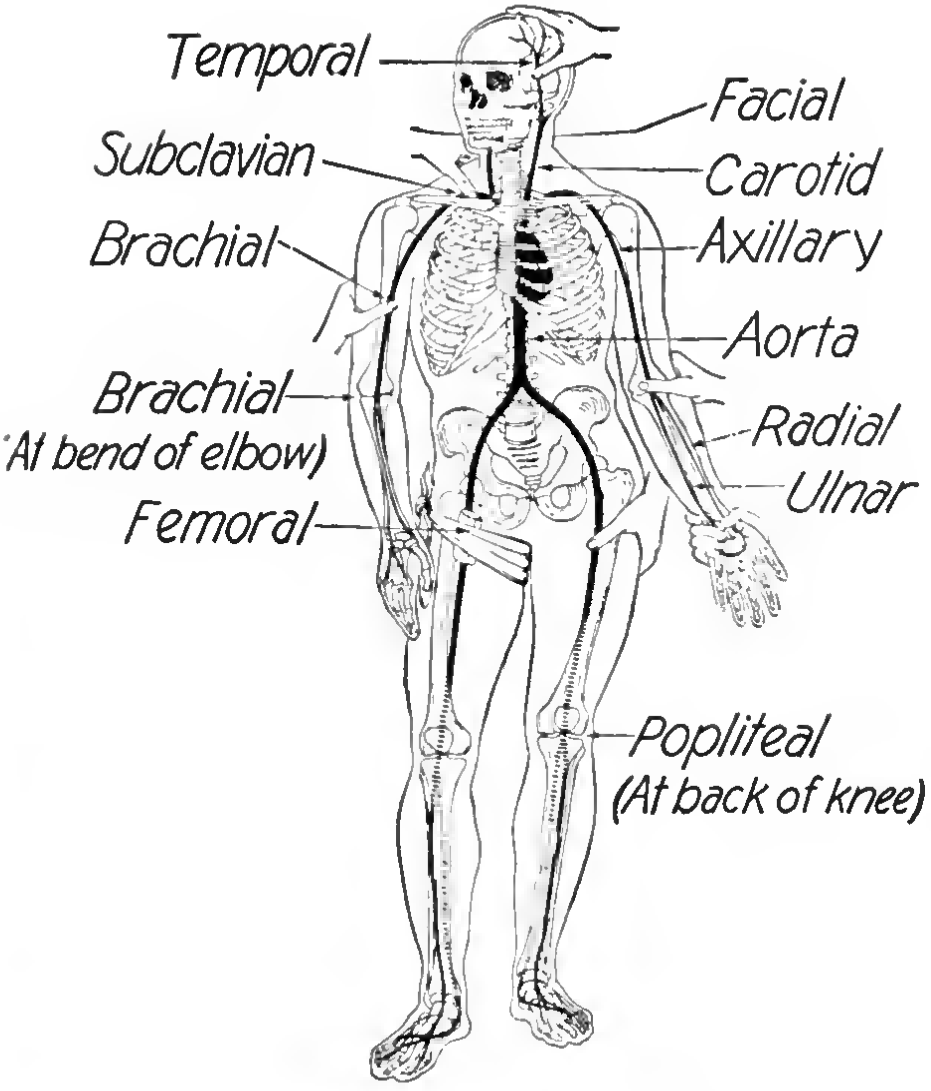
If the accident involves serious personal injury or death, immediately notify the District Engineer, Division Engineer or Resident Engineer by telephone or radio. He shall immedinately notify the office of the State Highway Engineer in Helena.

(C) INVESTIGATION

Every accident that occurs should be carefully investigated by the person who has supervision of the work.

The purpose of the investigation is to find out how to stop the same type of accident from happening again.

The investigation should include what happened, the acts of persons involved, conditions involved, why were acts committed, why did conditions exist and the corrective measures taken.



Course of Arteries; Pressure Points.

Section 4

OPERATION OF MOTOR VEHICLES

(A) LICENSE

A driver's license must be carried by all persons operating a motor vehicle and truck drivers must carry a chauffeur's license in addition, and must be over 18 years of age.

(B) TURNING

General—

Slow down gradually and **give the drivers following a chance to change their pace and either stop or go around your vehicle.**

Right Turn—

Get in the proper lane, give the approved signal for a right turn, slow down far enough from the corner, look both ways on intersecting highway before making the turn, keep close as possible to the right, do not turn widely to the left before entering the intersecting highway.

Left Turn—

Approach and start the turn from the center lane or as near as possible to the center of the highway from your side of the road; give the approved signal for a left turn; **yield the right of way to all vehicles which the turn might block or hinder;** always enter the right half of the street or highway into which the turn

is being made. Do not make left turns that can be avoided by going around the block.

(C) BACKING

Avoid backing wherever possible. When you have to back, get out and walk back to be sure there is nothing behind you.

If necessary to back some distance, stop part way, then get out and check your safe progress. This is part of your job of backing safely.

In backing a large vehicle, try to have someone guide you. Have the guide stand to one side and signal but not call. Never let your guide get back of your vehicle as you may crush him against some object. Regardless of being guided, the driver is not relieved of his responsibility to back safely as the guide does not have control of the vehicle and can neither start or stop it.

Park where you will not have to back to get away from the parking place. If you have to use a driveway and have to back in or out, where possible, back into the driveway so you can drive out forward and see where you are going. Always back slowly.

(D) PASSING

Always give yourself plenty of time to pass. It is the responsiblity of the driver who is passing not only to pass in complete safety, but to get back into the line safely without cutting in or causing confusion to others.

When starting to pass another vehicle and you are not sure the operator of the other vehicle sees you, don't try and sneak by but blow your horn one short blast to call it to his attention.

The cue indicating when it is safe to start and cut back after passing is when you begin to see in your center rear view mirror the front of the vehicle just passed.

Do not pass at intersections, on bridges, or by weaving through traffic.

(E) SAFE DRIVING PRACTICES

Defensive Driving—

A defensive driver is one who makes allowances for the lack of skill and lack of knowledge on the part of the other driver, who recognizes that he has no control over the actions of other drivers and pedestrians, nor over conditions of weather and road, and who therefore develops a defense against all of these hazards. He yields the right of way and makes other concessions to avoid collisions. He is careful to commit no driving errors himself, and is defensively alert to avoid the accident traps and hazards created by weather, roads, pedestrians and other drivers.

All state drivers should practice defensive driving.

Driver Responsibility—

It is the personal responsibility of every driver to operate without an accident and to be

constantly on the alert so that he is not caught in a last minute effort to avoid an accident. Neither icy roads, curves, hills, narrow roads, the absence of signs or signals, signals out of order, nor carelessness, nor ignorance on the part of others relieves the driver in the slightest degree of his responsibility for safety.

Signals By Drivers—

Many drivers place too much reliance upon signals. **They seem to be of the opinion that when they switch on a turn signal, that they are relieved of any further responsibility toward others on the hgihway, that they may proceed to turn right or left, and that it is up to the other driver to look out for them. Nothing could be further from the truth.**

Even though turn signals are properly set it is still the responsibility of the driver to have his vehicle in a safe position for a right or left turn and **to complete the turn without accident.**

Drive Both Cars—

An expert and alert driver figures out what the other driver might do and acts accordingly. He is ready to stop for the fellow who runs through on the yellow light, he lets the reckless passer into line even though tempted to squeeze him, he watches for the fellow who may pull out of a parking space, if possible he stays out of the way of the approaching driver who is

trying to get back in his own lane, he shrugs his shoulders and lets the road hog have his way.

Safe Following Distances—

One car length for each ten miles of speed or multiply the speedometer reading by two and use this answer in feet.

The desirable following distance is one in which your vehicle is far enough behind the vehicle ahead so that there is no danger of striking it in case it stops or changes direction suddenly, but not so far that other vehicles will constantly overtake or pass you. On open road our trucks in convoy must stay at least 500 feet apart.

(F) SPEED

Driving Too Fast for Conditions—

The competent driver s h o u l d adjust his speed so that he has his vehicle under control at all times; he should at all times drive at a safe speed; reduce speed on slippery, narrow or rough roads, reduce speed in congested areas, reduce speed after dark, never overdrive headlights and approach intersections at a s a f e speed.

Driving in Bad Weather—

Rain, snow, fog, sleet, or icy pavement have never caused an accident. These conditions merely add more hazards to driving, and make the normal hazards worse. Accidents are caused

by **drivers** who do not adjust their driving to meet these conditions.

Stopping—

Distance required for stopping at different speeds with good brakes, on dry surface and by a fairly alert driver:

Miles per Hour	Reaction Distance	Braking Distance	Total Stopping Distance
20	22 feet	30 feet	52 feet
30	33 "	67 "	100 "
40	44 "	120 "	164 "
50	55 "	188 "	243 "

Maximum Speed—

The maximum speed limit for trucks is 50 miles per hour and the speed for cars at night is 55 miles per hour on the open road. Lower speeds are required in cities and certain other posted locations.

Minimum Speed—

No driver shall drive at a speed which is so slow as to block the normal movement of traffic except when it is necessary for safe operation.

When traffic is blocked by necessary slow speed of the state vehicle, the driver shall pull off the pavement occasionally when possible so as to permit the blocked traffic to pass.

(G) CHARGEABLE (PREVENTABLE) ACCIDENTS

A preventable accident is any accident in which the driver failed to do everything he

possibly could have done to prevent or avoid the accident.

1. **Backing Accidents:**

Responsibility for backing safely is entirely the driver's. Backing is dangerous only if the driver neglects to make sure the way is clear during the entire movement. The driver is responsible for making sure the way is clear when backing through the use of rear-view mirrors, looking back, and getting out to look.

2. **Intersection Accidents:**

Intersections are dangerous locations because a lot of traffic movement is crowded into a small area. Safe passage requires exceptional driving caution. Thorough investigation usually shows that intersection accidents can be prevented.

3. **Pedestrian Accidents:**

Pedestrians long ago established a prior right to free movement. Whether they have the right-of-way or not, there is always a moral responsibility to yield the right of way to pedestrians. These accidents are usually considered preventable.

4. **Rear-end Collisions:**

Accidents in which your vehicle collides with the rear of the vehicle ahead are seldom excusable. A sudden stop by a vehicle ahead is a common occurrence, and every driver

should be prepared for it. It is the driver's duty to follow at a safe distance and have his vehicle under control.

5. **Traffic Lane Encroachment Accidents:**

Accidents resulting from passing, weaving, squeeze-plays, shut-outs, or entering a line of moving traffic have no place in the record of a professional driver. Such accidents are caused by trespassing on the right of others to move in a straight line without interference.

6. **Accidents Resulting From Mechanical Condition:**

It is the driver's responsibility to operate within the limits of the vehicle's mechanical condition. An accident blamed on mechanical failure as a result of a driver operating his vehicle in excess of its mechanical limits, or an accident blamed on mechanical failure that resulted from a driver's rough or abusive handling, shall be considered preventable.

7. **Accidents With a Railroad Train—**

Drivers always loose a good deal more than their safe driving record when they gamble with a railroad train. Trains always have the right-of-way. If a driver is involved in an accident with a train, the accident is considered preventable.

8. **Collisions With Stationary Objects:**

Collisions with stationary objects, as buildings, signs, trees, posts, bridges, parked vehi-

cles, and various overhead obstructions, are considered preventable as stationary objects don't run into vehicles.

9. **Accidents Blamed on Adverse Weather Conditions:**

Rain, snow, fog, sleet, or icy pavement have never caused an accident but merely add more hazards to driving.

Accidents are caused by drivers who do not adjust their driving to meet these conditions. Accidents blamed on skidding or bad weather conditions are classed as preventable.

(H) CONDITION OF EQUIPMENT

Inspection and Maintenance—

It is the responsibility of the driver not only to operate his vehicle but also to make daily inspection to see that it is kept in good mechanical and safe condition. The driver knows when brakes need adjustment, when steering is loose and shaky, when one headlight is out, and should see that the items are corrected promptly.

Braking—

Be sure your brakes, both foot and emergency, are working properly before you start out. If your vehicle does not have brakes, don't drive it.

Avoid locking the wheels by sudden braking, apply the brakes gradually, then release them, repeat this until the vehicle is stopped.

Leave the clutch engaged until just before you come to a full stop, then disengage the clutch to keep from stalling the motor.

Check your brakes after passing through water.

Reduce your speed before reaching a curve so you will not have to brake while going around the curve.

Lights—

Keep all lights in good repair as you may need them anytime.

Never drive without lights at dusk, in fog or at night; the other driver coming toward you may be doing the same thing.

Headlights serve two purposes, to aid vision, and to help others see your vehicle.

Headlights must be turned on from one half hour after sunset to one-half hour before sunrise and at any other time that weather conditions make it necessary.

Amber Flasher Lights—All snowplows and motor graders used for plowing snow and trucks used for sanding ice shall be equipped with **amber** flasher lights which are only to be burned while the equipment is actually engaged in plowing snow or sanding operations.

Lights on Emergency Vehicle—Upon the immediate approach of an authorized emergency

vehicle making use of audible and visual signals, the driver of every other vehicle shall yield the right-of-way and shall immediately drive to a position parallel to, and as close as possible to the right hand side of the road, clear of any intersection and shall stop until the authorized emergency vehicle has passed.

Tire Chains—

Use your tire chains whenever the conditions are bad and don't wait until you get stalled in a dangerous spot before you put them on.

Winterized tires are a help under dry snow conditions but when the snow packs down hard, and smooth or melts and freezes into hard ice they are of doubtful advantage.

You can proceed safely with good tire chains when it is impossible to proceed otherwise.

Keep your tire chains as tight as possible, as more chains are pounded to pieces than are actually worn out.

Gasoline—

(a) The motors of all equipment shall be stopped while filling gasoline tanks, and care exercised to prevent overflow of gasoline. The nozzle of the gasoline pump hose shall be kept in direct contact with the tank to guard against ignition of gasoline by static electricity.

Section 5

OPERATION OF POWER EQUIPMENT (Not Vehicles)

(A) **Movement of Equipment—**

The moving of heavy equipment such as shovels, dozers, etc., by the use of trailers or other trailed equipment, requires a great deal of planning.

All over width loads shall be moved with the use of pilot cars to warn the traveling public.

Routes should be carefully planned so the heavy load is not routed over county roads with weak bridges.

When traffic piles up behind the slow moving equipment, an effort should be made to pull off of the pavement where possible and let the traffic by.

When a small trailer or other piece of equipment is towed, safety chains may be securely fastened to the trailer frame and the vehicle. This chain shall be hung with not more than six inches of slack and connected to the trailer tongue to prevent it from dropping if the vehicle couplings fail.

(B) **Loading of Equipment**

All trucks loading under a shovel should be equipped with cab guards. If trucks are not so equipped the driver shall get out of the cab

while the truck is being loaded. The driver shall stand clear of the swing of the bucket so as not to be struck by rocks which might roll off of the truck while it is being loaded.

Even though the truck is equipped with a cab guard it is a good practice to get out of the cab when large rocks are being loaded.

(C) **Operation of Equipment—**

No operator shall attempt to do any work with a power shovel that is beyond the safe limit of the equipment. Lifting of large rocks beyond the capacity of the shovel is dangerous and could tip the shovel over especially when the swing is made.

Never swing the bucket over the cab of the truck.

Shovel operators shall be cautioned about working their equipment too close to the edges of cuts or fills.

Do not unload bucket from extreme height above trucks.

Trucks shall be loaded so no material will fall off while being hauled.

Never reach or get under a raised truck bed unless the bed has been blocked.

Dozers and graders shall be parked on level ground if possible with the blades lowered before leaving them.

Dozers working in timber shall be equipped with cab guards.

Never crawl under a dozer blade unless it has been blocked.

If possible make all turns with the operator on the up-hill side of the dozer.

(D) **Power Lines—**

Extreme caution shall be used when operating shovels and cranes near power lines unless you are certain the power has been cut off.

If the power is not cut off be sure the swing of the bucket or boom is never within eight feet of high voltage lines.

Section 6

OPERATION OF SHOPS

(A) **Machinery—**

All hazardous machines shall be properly guarded; saws, line shafts, belts, gears, etc. shall be guarded.

Engine Lathes—

Wear suitable clothing when working on a lathe, so that nothing can get caught in the work.

Keep fingers away from rotating work and moving parts of the machine. Use shifter to shift belt.

Always allow lathe to stop turning by itself, not by placing hand on the chuck or belt.

Play safe and wear the proper type of safety goggles or face shield when working on the lathe.

Keep the lathe bed and floor surrounding the machine free of chips and turnings.

Use suitable bench or rack for tools so they can be kept off of the lathe.

Drill Presses—

Use drill vice when drilling small parts, clamp larger parts securely.

Use brush to remove chips from table and work.

Remove chuck key and drift from sleeve of drill before starting machine.

Keep tools, brushes, etc., where they can be found without reaching in back of machine.

(B) **Clothing**

Wear clothing that fits properly while working on machinery around the shop.

Keep sleeves buttoned or cut off. Avoid wearing loose clothing that can get caught in the running machinery.

(C) **Hand Tools—**

Always use your welding helmet when welding. Electric welding offers a much greater eye hazard than gas welding.

All welding operations involve the hazard of flying sparks and metal splashes.

Watch the wrenches and other tools you use. Keep them in a safe working condition and use the right tool for the job.

Electric hand tools should be grounded with an extra wire if one has not been built in.

Use some sort of push stick or tool to push short pieces of wood past the saw blade when operating band or circular saws.

(D) **General—**

Goggles or shields must be used when grinding. Don't trade a good eye for a plastic one.

Never depend on jacks or chain hoists alone to support a car you have to work under. Block it.

Use only electric extension lamps and portable electric tools with cords and fittings that are in good condition.

Be sure your feet are clear of passing automobiles or moving machinery when you get under a car.

Do not wash parts in gasoline or leave gasoline standing around in open containers.

Don't attempt to lift anything too heavy for you. Get help or use a hoist.

If your clothes become soaked with oil or gasoline, change them. Don't take the risk of catching on fire.

Making adjustments on motors when they are running is dangerous and particular care should be used to keep from getting hand in fan or on hot manifold.

(E) **Carbon Monoxide—**

Carbon monoxide is colorless, tasteless, and odorless, giving no hint of its presence.

Guard against carbon monoxide gas from the exhaust of running engines.

When it is necessary to work on equipment with the motor running inside the shop, be sure you have all the possible ventilation or a tube on the exhaust pipe to carry the gas away.

Symptoms are, dizziness, nausea, weariness, throbbing heart and cherry red color of skin.

First aid treatment consists of carrying victim to fresh air. Keep him warm, call a doctor,

and give artificial respiration if breathing has stopped.

(F) **Toxic Cleaning Material—**

Carbon tetrachloride has a high electrical resistance and is of chief value for fire in electrical equipment.

The fumes are toxic (poisonous) and therefore, in closed areas of limited size, care should be taken not to breathe the fumes.

Celluloid decomposes readily on being heated to about 300 degrees, giving off heat and large volumes of toxic gases (mostly carbon monoxide).

Some steam cleaning compounds give off toxic gases, and where they are used in closed areas of limited size, respirators should be used.

Some of these poisons are absorbed through the skin as well as by breathing the fumes.

Do not clean the skin with carbon tetrachloride, gasoline, turpentine or thinners.

When using fire extinguishers on a fire, stand on the windward side of the fire whenever possible so you won't breathe the toxic gases.

In all forms of burning it is a good practice to stay out of the smoke as much as possible to avoid possible toxic gases.

Section 7

STORAGE OF SUPPLIES AND MATERIALS

(A) **Flammables—**

All storage tanks shall be equipped with proper relief vents.

Vents shall not be located close to open flame, heating apparatus or any source of ignition.

Inside storage of inflammable liquids or lubricating oils in drums, cans or other containers shall be guarded against any ignition source and whenever possible shall be segregated in a fireproof room or separate building.

(B) **Heavy Materials—**

When storing lumber, cross sills shall be placed for foundation.

When lumber is piled above four feet high, cross strips shall be used.

Individual piles of lumber should not be wider than eight feet.

Barrels, cans, and kegs shall be stored on end when in bulk storage.

Planks or sheathing shall be placed between each tier to stabilize the pile.

Full barrels shall not be piled over two tiers high, and empty barrels shall not be piled over three tiers high.

Bagged material shall be piled on a solid, even surface. To prevent bags from falling out-

ward, the first tiers of bags each way from the corner should be crossed piled and proper set-backs shall be made.

When bags are removed from the pile, the length of the pile should be kept at an even height, and the proper step back maintained.

Corrugated or flat iron should preferably be stacked in flat piles.

Racks capable of supporting the load may be used for steel plate when it is desirable to store it on edge.

Pipe of all kinds should be carefully stacked and blocked at the ends of the pile to prevent spreading. In removing pipe from a pile which has not been blocked, employees should not approach the side of the pile but should remove it from the ends of the pile.

Large piles of round posts shall be securely blocked at both ends, and when removing posts they shall be taken from the top of the pile and not from the end.

(C) **Housekeeping—**

Good housekeeping is very important in storercoms and in yards. Material shall be stored to prevent falling, tripping and collision hazards.

Keep aisles clear—especially those to the fire extinguishing equipment.

Keep ladders in good repair; place them carefully. Do not stand on boxes or benches, or climb the face of bins.

(D) **Fire Hazard—**

Good housekeeping is a "must" for safety and fire protection.

Waste, excelsior, rags, and crates shall be promptly removed from warehouse after material has been unpacked.

Metal cans with covers shall be installed for used oil or paint rags.

Fire extinguishers shall be located in warehouse at locations where they can be reached in case of fire. Extinguishers shall be kept in good condition and employees should know how to use them.

Rubbish shall not be allowed to accumulate in the yards but should be burned promptly.

If outside refuse burners are used, they shall be located a safe distance from buildings, lumber piles and other inflammable material.

Section 8

HAND OPERATIONS— USE OF SMALL TOOLS

(A) **Road Maintenance—**

Workers shall be sure they are on good footing and clear of obstructions or fellow workers before using axes, hatches, brush hooks, scythes, sledge hammers and similar tools.

The foreman is responsible for the condition of tools in his charge, and should be certain that the men they are assigned to understand how to use them.

All tools shall be kept in good condition and shall only be used for the purpose intended.

Mushroomed wedges, chisels and punches shall be replaced or repaired.

Axes should not be used as a striking hammer.

Rock hammers shall not be used for striking hammers, as it does not have the proper face for this purpose. Also the face of the rock hammer will be destroyed.

When burning brush or weeds, check the direction of the wind before starting the fire, so the smoke will not blow across the pavement and be a hazard to the traveling public.

(B) **Use of Hot Asphalt—**

See that kettles are dry b e f o r e putting asphalt in them; know what grade the asphalt

is, and do not heat it in excess of the maximum for that grade. Use thermometer. If smoke is a dense yellow, it is about to catch on fire—reduce heat immediately.

Have fire extinguisher, and be sure you know how to operate it. If you have to use the extinguisher, be c a r e f u l not to breathe the fumes.

When burners go out, do not light with a match, but use a long torch.

Inspect fuel and asphalt hoses on kettles frequently. If any defects show up, replace the hose, and do not cut off the end and re-use it.

(C) **Bridge Maintenance—**

Ladder Maintenance: Good ladder maintenance is a must to keep a job safe. The three main causes of ladder accidents are:

1. Broken sections.
2. Improper setup.
3. Unsafe practices of workers.

Faulty scaffold construction causes m a n y falling accidents. Some of the causes are:

1. Use of material that is too light.
2. Failure to overlap or fasten floor planks.
3. Improper bracing.
4. Knotty or inferior lumber.
5. Handrail left off.
6. Too few nails or improper size used.

All scaffold planks shall be tested by supporting each end and one foot or more above the ground and loading them with a weight at least four times as heavy as the load they will be required to carry when in use.

Working from Ladders—

1. Place ladder securely against solid backing. Place the foot of the ladder one-fourth of the length of the ladder away from the building.

2. Clean mud or grease from shoes before climbing up to work.

3. Face the ladder and hold on with both hands whenever climbing up or down.

4. Work facing the ladder and hold on with one hand.

5. Use safety belt if the nature of the work requires it.

6. Do not reach too far from a ladder in any direction—move the ladder.

7. Do not splice two ladders together. Get one long enough for the job.

8. Do not use a ladder as a horizontal member of a scaffold.

Swinging Scaffolds—

1. Never overload a scaffold.

2. Always tie the fall lines to the scaffold itself, never to any part of the building.

3. When using acid or caustic solutions, take every precaution to keep them from getting on scaffold ropes.

4. Jumping onto or from a scaffold is dangerous. Do not climb or slide down the suspension ropes.

5. Remove all loose objects from the scaffold when stopping work for meals or when leaving for the day.

6. No work should be done on swinging scaffolds during stormy weather.

Hard Hats—

Employees required to work where overhead structures, equipment, or materials create a hazard, shall be provided with hard hats and are required to wear them at all times while so employed.

Life Jackets—

Men working above or on open water must be provided with, and must wear, life jackets.

Safety Belts and Life Lines—

Safety belts and life lines shall be provided and used when an employee is forced to work in a particular hazardous location.

Life Rings—

Life rings with line attached shall be in place on all bridges where employees are working over water five feet or more in depth.

Stairways, Ropes and Cables—

Risers in any stairway shall be of uniform height. No stairway shall be constructed with risers more than nine inches or less than five inches in height.

Do not use worn out rope or jagged cables. Replace them.

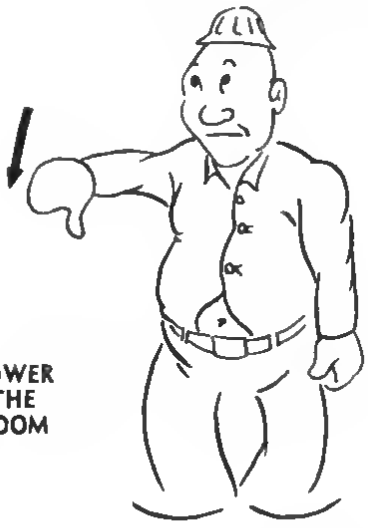
Do not use burned cable as it is unsafe if it has been heated enough to fry the grease from the inside.

Nails in the top of opened nail kegs are dangerous and shall be removed or hammered down.

Check peavie hooks after they have been used to roll rocks as a dull hook will slip when used on timbers.

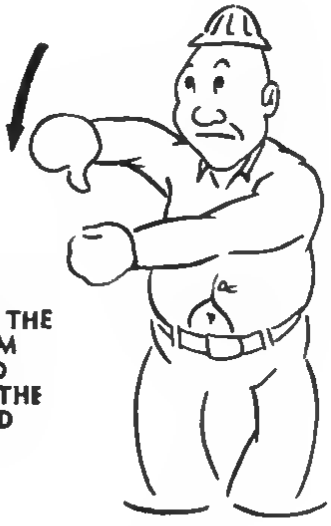
Signals to hoist operators shall be given by hand and not by calling.

STANDARD CRANE SIGNALS

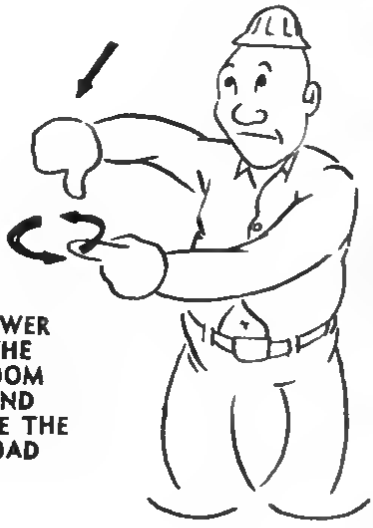


LOWER THE BOOM

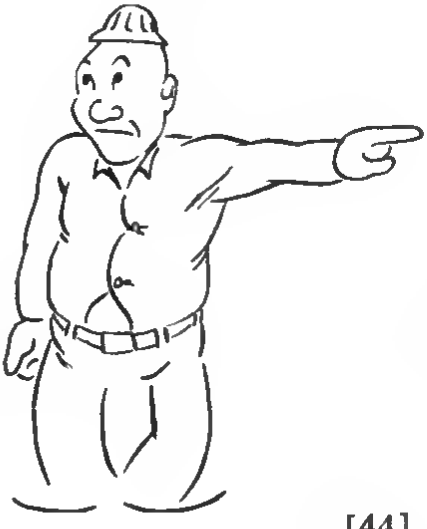
LOWER THE BOOM SLOWLY



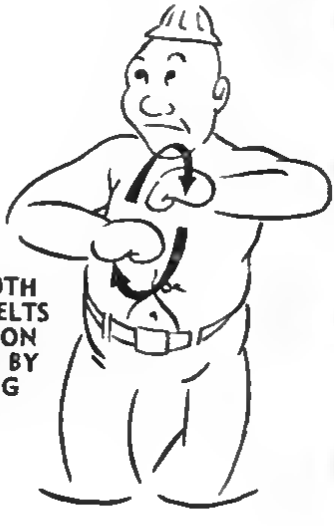
LOWER THE BOOM AND HOLD THE LOAD



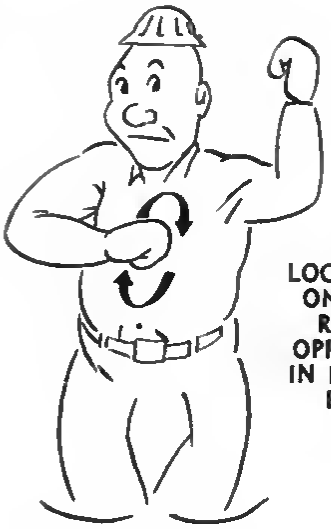
LOWER THE BOOM AND RAISE THE LOAD



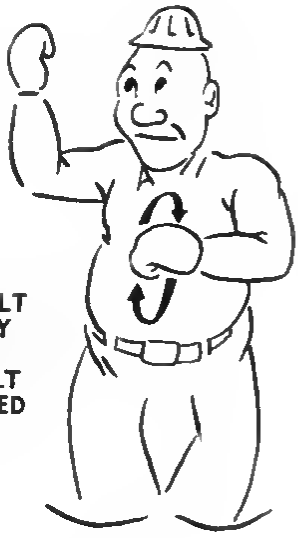
SWING THE LOAD IN DIRECTION FINGER POINTS



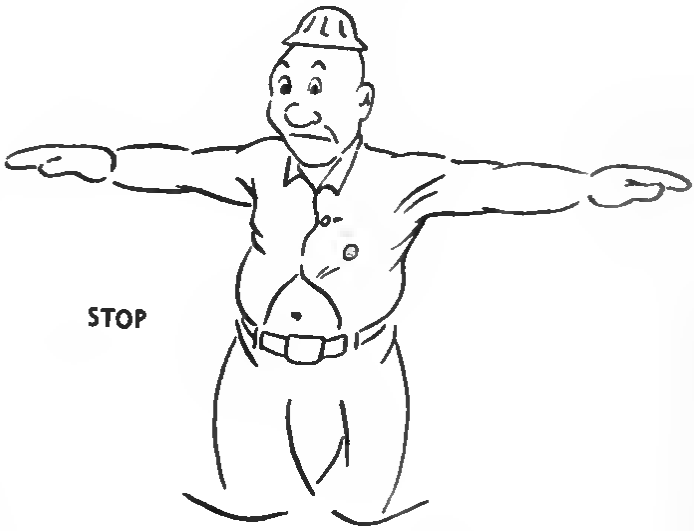
TRAVEL BOTH CRAWLER BELTS IN DIRECTION INDICATED BY REVOLVING FISTS



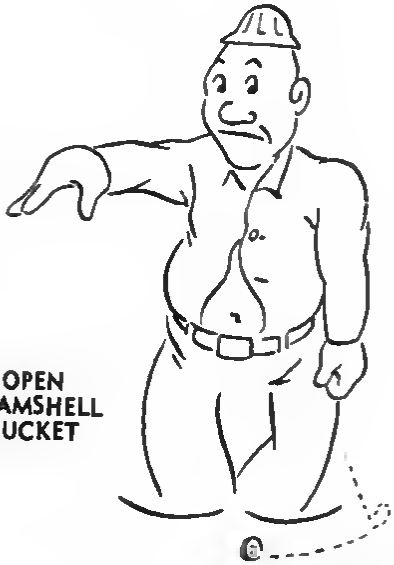
LOCK THE CRAWLER BELT ON SIDE INDICATED BY RAISED FIST—TRAVEL OPPOSITE CRAWLER BELT IN DIRECTION INDICATED BY REVOLVING FIST



DOG EVERYTHING



STOP



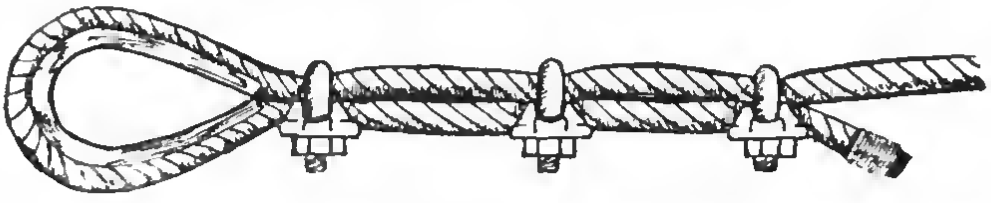
OPEN CLAMSHELL BUCKET

CLOSE CLAMSHELL BUCKET

Diameter of Rope	Number of Clips Required	Space Between Clips
1 1/2 inch	8	10 inches
1 3/8 inch	7	9 inches
1 1/4 inch	6	8 inches
1 1/8 inch	5	7 inches
1 inch	5	6 inches
7/8 inch	5	5 1/4 inches
3/4 inch	5	4 1/2 inches
3/6 to 5/8 inch	4	3 inches

RIGHT

WRONG



WRONG

PUT CLIPS ON RIGHT

Cable Clamps—

The use of cable clamps or clips for joining lines is prohibited, except where used for transferring of slack lines from one place to another. If used at all, U-bolt should be over the short end and the clamp over the part which carrier the load.

U-bolt type clips properly attached and in conformity with number and spacing as given in the following table will be considered as developing 80% of rated rope strength.

(D) **Engineering—**

All men doing slashing on line should be instructed in the proper use of axes, brush hooks and machetes, and should keep safe distance between each other.

The dragging of tapes behind a car is dangerous as you can get seriously injured if some car should run over the tape.

Be careful under power lines when using a steel tape or metallic tape. Never throw a chain where the wind might blow it on a power line. On uneven ground be careful not to strike the power line when you pull the slack out of the chain.

Section 9

PROTECTIVE DEVICES

(A) **Machine and Equipment Guards—**

It is the duty of the employee operating a machine to see that all guards are in place before starting the machine.

Do not remove any guards to make repairs while the machine is running. Guards which have been removed to make repairs shall be replaced before the machine is started.

(B) **Protective Clothing—**

Safety hats shall be worn whenever there is a possibility of being struck by falling objects, or where there is a possibility of bumping the head.

Welders' helmets shall be worn while welding or welding inspection.

Goggles shall be worn when grinding, wire brushing and in excessive dust.

Safety belts shall be worn when working on high level work that is especially hazardous.

Life jackets shall be worn when working on structures over water.

(C) **Fire Extinguishers—**

All cars and trucks shall be equipped with a fire extinguisher of the liquid pump type and all buildings shall be equipped with foam type or carbon dioxide type extinguishers.

Extinguishers shall be kept in good condition and refilled as specified.

Vaporizing liquid pump type can be used on class B fires—oil, gasoline and other flammable liquids, also on class C fires—electrical equipment.

Foam type can be used on class A fires—wood, paper, rubbish and deep seated fires, also on class B fires—oil, gasoline and other flammable liquids.

Carbon dioxide type can be used on class B fires—oil, gasoline, alcohol and other flammable liquids, also on class C fires—electrical equipment.

(D) **Signs—Barricades—Flares—**

It is the responsibility of Engineers, Supervisors and Foremen to see that slow one way traffic ahead or other warning signs are properly placed to protect our men and the traveling public before work is started on any highway, and to see that they are removed when no longer required.

Slow one-way traffic ahead signs shall be used when one lane of the highway is obstructed, but for no other purposes.

All warning signs shall have a red flag attached to the upper left hand corner.

All mowers shall be equipped with a red flag mounted on a limber pole or another device eight feet above the ground.

Excavations in the roadway shall be protected with barricades in addition to the signs,

and at night flares shall be placed at the signs and at the barricades.

(E) **Flagmen—**

Before flagmen are used, they shall be instructed on the proper methods of flagging.

Regular flagmen on paving, oiling and other large extra gangs, shall be provided with a red jacket, hard, hat, and a hand sign, with "Stop" on one side and "Slow" on the other side.

Temporary flagmen will use the hand sign for flagging, but whenever possible the red coat and hard hat should also be used.

The flagmen shall stand just outside of the lane of approaching traffic.

To stop traffic, hold the hand stop sign horizontally over the pavement.

To signal traffic to proceed, lower the stop sign, and signal with the hand but never wave the traffic ahead with the hand sign. After the traffic starts moving, display the slow sign to keep the traffic at a slow speed.

The flagman has one of the most important jobs on the crew; he has the responsibility of protecting the traveling public, protecting our men and equipment, and also he has to protect himself.

Flagmen shall be used when one lane of pavement is obstructed by our work, and we are maintaining one way traffic.

Your Warning Word Is "TRAFFIC"

To the Flagman—"The Man who has the full responsibility for protecting his fellow workers and the traveling public." **Don't let them down!**

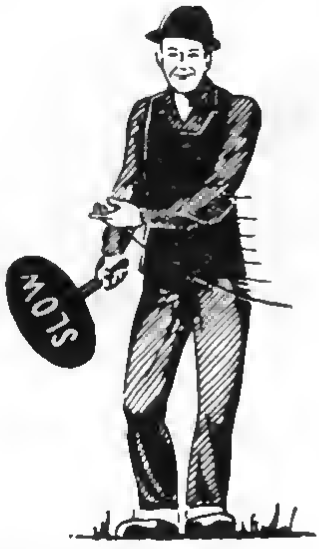
A flagman is responsible for the safety and the lives of the men at work as well as for the protection of highway users. They have the full right to depend on **you!**

Every possible precaution must be taken to avoid and prevent accidents.

Department employees must act with courtesy under any and all circumstances. There must be no display of temper. Arguments with the public, regardless of cause, must be avoided.

The position taken while flagging traffic is an extremely important matter to be considered. There is no single rule as each job will require a different set-up. However, these are important questions to ask yourself before you begin to handle traffic.

TO STOP TRAFFIC



TO MOVE TRAFFIC

(F) Bites of Poisonous Snakes

Symptoms:

The first symptoms of bites by poisonous snakes are a feeling of stinging pain and one or two small punctured wounds in the part struck and swelling and discoloration, which are evident in a very short time. The part becomes painful, and as the poison enters the system through the venous circulation general symptoms develop, such as great weakness, nausea, rapid, weak pulse, and a profuse flow of saliva. After a few hours muscular paralysis develops, and the patient passes into a stupor.

Treatment:

Treatment should be started at once.

Keep the patient lying down and quiet to slow circulation and retard absorption of the poison.

Immediately apply a constricting bandage, several inches above the wounds, between the wounds and the heart. This retards the flow of blood into the superficial veins and prevents absorption of the poison.

An area several inches square around the wounds should be sterilized with a suitable antiseptic and then incised through each of the wounds by cuts about 1/8 inch deep and ½ inch long in the form of an X. A sharp knife, the tip of which has been held in the flame of a burning match, is satisfactory for making incisions.

Press the outside of the wounds to make them bleed freely. To promote bleeding suck the wounds, and spit out the blood. No harm can come from sucking the wound if there are no sores in the mouth or on the tongue. Continue the bleeding 20 minutes, then loosen the constricting bandage 1 minute. Retighten the constricting bandage, and continue drawing blood from the wounds. Additional incisions may be made around the bites if much swelling takes place. Repeat this procedure until medical aid can be procured.

Treat the patient for physical shock, DO NOT GIVE ANY STIMULANTS.

Section 10
TRAFFIC HAZARDS

(A) **Repairing Surface—**

Before any work is started on the road surface, proper signs, barricades and flagmen shall be placed.

Work on one lane only unless the traffic is being held for short periods.

Men should be cautioned about staying inside the lane which is blocked.

Look both ways before crossing the highway.

Flagmen shall never be in the center of the pavement and let the traffic move both ways as this is very dangerous and if one line of traffic should crowd him he has no place to go except into the other line of traffic.

When working shovels on narrow highways where swing interferes with traffic during loading, don't force traffic into the ditch but hold them until truck is loaded and then let the traffic through.

(B) **Parking and Backing—**

When working on the road surface all equipment shall be kept on the same side of the highway where possible, and in no case shall they be parked opposite each other.

Whenever possible, park your vehicle where you will not have to back.

When working between signs and flagmen, and one-way traffic is being maintained, the driver of our truck should keep a sharp lookout for traffic when backing or turning in the area.

(C) **Engineering Crews—**

Much of the work done by engineering crews is done on the road surface and is subject to the traffic hazards on the construction job as well as from the traveling public. The transit man is forced to set up the transit in the center of the road, and the chainmen are forced to chain down the center of the highway, and most of the time they have their back toward one lane of traffic.

Do not work on the roadbed at any time without the proper warning signs.

When working around curves or under heavy traffic, use flagmen.

On construction work, put out your signs or flagmen and don't rely on the contractor's signs or flagmen to protect you.

(D) **Bridge Repairs Under Traffic—**

Bridge repairs under traffic are very haardous both to our men and also to the traveling public, and all possible precautions shall be taken to protect both our men and the traveling public. When you get in a tight spot on a bridge you will either get hit or you will have to go over the side.

Always use plenty of signs, flagmen, barricades, and stop and go lights where possible when re-decking a bridge under traffic.

Unfinished work on the roadway shall be well protected at night with signs, barricades, lights, and flagmen if necessary.

Raising a bridge under traffic is hazardous and the following are good bridge jacking practices:

1. Jacks must be maintained in good condition.

2. Jacks shall be well seated on solid level footings. Jack plates shall be used top and bottom. When jacking steel on steel a thin wood shingle or plywood cushion is recommended.

False caps shall be brought to solid bearing on all stringers and secured.

3. Jack shall be centered on jack staff and footings, and jacks and jack staff shall be set plumb and kept plumb.

4. Jacking shall be followed closely with blocking; posts and false bents shall be of good sound material. Replace several smaller blocks with large blocks or posts.

5. Jacking shall be in short lifts; never extend jacks beyond safe limits; block up and reset jacks often.

6. Blocking, posts and bents shall be kept properly plumped, nailed and braced at all times.

7. A structure must be placed on solid blocking, well braced posts or bents, with all load off jacks.

(a) before vehicles are permitted on structure

(b) before old bent is removed

(c) before workmen are permitted to proceed with other work under the bridge.

8. Heavy loads shall be permitted to cross a structure on temporary falsework only with care and slowly, and after all workmen are in the clear.

Section 11
USE OF EXPLOSIVES

(A) **Training of Users—**

All powder men shall be competent and experienced in the handling of explosives. The powder man shall be held responsible for the use of all possible precaution with the use of explosives.

Powder boxes shall be opened with care using a wooden mallet.

Cartridges shall only be removed from the boxes as they are needed for immediate use.

Cartridges showing glycerine crystals on the outside shall not be used.

Blasting caps shall not be carried in pockets of clothes.

Do not use dynamite that is frozen.

Explosive actuated tools shall only be operated by qualified operators having operator's license.

(B) **Transportation of Explosives—**

Explosives shall be transported in daylight if possible.

Trucks transporting explosives shall be equipped with not less than two fire extinguishers.

No person other than the driver and an authorized companion shall be permitted to ride on trucks transporting explosives.

When explosives are carried on a truck without a top, they shall be protected from the sun and weather with a tarpaulin.

Powder or caps shall not be hauled with a work crew.

Do not use radio telephones while hauling blasting caps unless they are in a closed metal container.

Do not use radio telephone when in the location where a blast is being loaded.

(C) **Storage of Explosives—**

The storage of powder in maintenance sheds is prohibited; use the powder magazine. Magazines shall be bullet proof and fire proof and shall be kept locked.

Blasting caps or detonators shall never be carried in a vehicle along with explosives or be stored in the same magazine with other explosives.

Boxes of explosives shall be placed in such a position that the cartridges will not stand on end.

Do not store anything except explosives in a powder magazine.

(D) **Protection of General Public—**

When a shot is about to be fired all persons near the place shall receive ample warning and the blast shall not be fired until it is absolutely certain that everyone has moved to a safe distance.

On the highway use flagmen to stop the traffic far enough from the blast to be sure they are out of danger.

It is the responsibility of the blaster to make certain that the traffic is stopped before the shot is set off.

Shots shall only be set off by the regular blaster.

Blasting machines shall be used wherever possible as a lot of the hazards are eliminated.

Misfires cause a large percentage of blasting accidents.

Don't return to a misfired shot too soon, and hold the traffic if there is any question.

Handling of a misfire is a job for the experienced blaster only.

clip here

Name.....

District.....Division.....

I have received a copy of the Montana State Highway Department Safety Manual. I promise to carefully read these rules and I understand that I am required to observe them.

Signature..... Date.....

Note: This form is to be signed by the employee and will be placed in the employee's file in personnel records.